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## BRIEFER ARTICLES

### INCLUDED CYTOPLASM IN FERTILIZATION

In the recent review<sup>1</sup> of NĚMEC's paper on the fertilization of *Gagea lutea*,<sup>2</sup> the following statements occur: "Another apparently unusual feature is the inclusion of cytoplasm between the fusing nuclei. . . . This is the second record of such a cytoplasmic inclusion, the first having been made by BROWN<sup>3</sup> in his study of *Peperomia*."

Since this is a rarely recorded phenomenon, I may be permitted to call attention to some earlier references to the inclusion of cytoplasm between the sexual nuclei in plants at the time of fusion. In a paper published in 1901,<sup>4</sup> the following sentence occurs (p. 450): "Frequently the cytoplasm caught between the two nuclei collects in spherical masses; between these spheres of cytoplasm the membranes of the nuclei come into close contact (fig. 52)." This sentence is likewise repeated on p. 116 of a later publication.<sup>5</sup> I would also call attention to figs. 51, 53, and 54 of the earlier paper, and figs. 224-227 of the later paper, which were redrawn from the same preparations as the figures published earlier.

BROWN first figured and described the inclusion of cytoplasm between the fusion nuclei in 1908.<sup>6</sup> If other students of plants have mentioned this subject, I am not aware of it.

In the papers published in 1901 and 1904, I made no special comment, other than the sentence quoted above, on the inclusion of cytoplasm between the sexual nuclei, because this is one of many observations which have convinced me that nucleus and cytoplasm cooperate in all cell

<sup>1</sup> CHAMBERLAIN, CHARLES J., Fertilization in *Gagea*. BOT. GAZ. 55:472. 1913.

<sup>2</sup> NĚMEC, B., Über die Befruchtung bei *Gagea*. Bull. Internat. Acad. Sci. Bohême 1912: 1-17. figs. 19.

<sup>3</sup> BROWN, W. H., The exchange of material between nucleus and cytoplasm in *Peperomia sintenisii*. BOT. GAZ. 49:189-194. pl. 13. 1910.

<sup>4</sup> FERGUSON, MARGARET C., The development of the egg and fertilization in *Pinus Strobus*. Ann. Botany 15:435-479. pls. 23-25. 1901.

<sup>5</sup> ———, Life history of *Pinus*. Proc. Wash. Acad. Sci. 6:1-202. pls. 1-24. 1904.

<sup>6</sup> BROWN, W. H., The nature of the embryo sac of *Peperomia*. BOT. GAZ. 46: 445-458. 1908.

divisions, whether in somatic or in reproductive cells. In the description of the division of the generative cell in *Pinus*,<sup>7</sup> this sentence appears (p. 209): "That the spindle-fibers which originate in the cytoplasm and apparently grow by a differentiation of its network are later fed by the linin of the achromatic nuclear reticulum there seems little room for doubt. In fact, all the phenomena connected with this division indicate that we are dealing, not with persistent cell-constituents, but with different manifestations of one and the same thing." With variations in method of expression, this idea is promulgated again and again in the three papers on *Pinus* to which reference has already been made.

It is interesting to find such convincing evidence of the transformation of cytoplasm to nucleoplasm, or at least, of its disappearance in the nucleoplasm, as that given by BROWN. The close student of the phenomena of fecundation and of nuclear division finds, also, many evidences, less clearly demonstrable but equally convincing, of the intimate relation between these two portions of the protoplasm.

There can be no doubt that threads from the cytoplasm unite with portions of the nuclear reticulum to form the spindle-fibers in the division of the generative cell in *Pinus*; and it is equally evident, at the time of fertilization, not only that the "included cytoplasm" disappears in the area occupied by the conjugating nuclei, but that a large part of the reticulum of the egg nucleus disappears in the general cytoplasm. These and similar unpublished observations on other plants convince me that certain portions, at least, of cytoplasm and nucleus are interchangeable.—MARGARET C. FERGUSON, *Wellesley College*.

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## HENRY WILLEY

(WITH PORTRAIT)

The work of HENRY WILLEY in lichenology entitles him to a more definite introduction among botanists than he has received. He was born in Geneseo, N.Y., July 10, 1824, and died in South Weymouth, Mass., March 15, 1907. During his active life he was the editor of a newspaper in New Bedford Mass., resigning that position in 1900. As a student of lichens, he probably ranked second only to TUCKERMAN, whose pupil he was, and whose last work he edited. His various contributions to the literature of lichens appeared during the period from 1867

<sup>7</sup> FERGUSON, MARGARET C., The development of the pollen tube and the division of the generative nucleus in certain species of pines. *Ann. Botany* 15:193-223. *pls.* 12-14. 1901.